

## PATENT ABSTRACTS OF JAPAN

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## (54) INTERMEDIATE FILM FOR SAFETY GLASS

(57)Abstract:

PURPOSE: To provide a intermediate film capable of taking the good balance between the venting easiness of air and the collapsing easiness of embossed parts, excellent in degassing properties and capable of producing safety glass good in transparency.

CONSTITUTION: In an intermediate film for safety glass composed of a thermoplastic resin sheet or film having a large number of fine uneven (embossed) parts on the single surface thereof, the embossed parts consist of main embossed parts and sub-embossed parts and the area  $[S \times 10^{-8} \text{cm}^2]$  of the bottom parts of the protruding parts constituting the main embossed parts and the average interval (apparent pitch)  $P[\mu]$  of the protruding parts have the relation of  $1.5 \leq P/S \times 100 \leq 5.5$  and the average roughness of the sub-embossed parts is  $1/2$  or less that of the main embossed parts. Further, the area  $S$  of the bottom parts of the protruding parts of the main embossed parts, the apparent pitch  $P$  of the protruding parts and the average roughness  $R$  of the main embossed parts and the area  $S'$  of the bottom parts of the protruding parts of the sub-embossed parts, the apparent pitch  $P'$  of the protruding parts and the average roughness  $R'$  of the sub-embossed parts satisfy specific relation.

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## CLAIMS

[Claim(s)]

[Claim 1] In the interlayer for glass laminates which becomes at least one side from the thermoplastics sheet or film which has much detailed irregularity (embossing) It has the relation which said embossing becomes from Maine embossing and subembossing, and average spacing [ of area / of the pars basilaris oiss occipitalis of the lobe which constitutes said Maine embossing / S [x10-8cm2], and said lobe ] (appearance pitch) P [μm] becomes  $1.5 \leq P/S \times 100 \leq 5.5$ . And the interlayer for glass laminates characterized by the average of roughness height of said subembossing being 1/2 or less [ of the average of roughness height of said Maine embossing ].

[Claim 2] In the interlayer for glass laminates which becomes at least one side from the thermoplastics sheet or film which has much detailed irregularity (embossing) Said embossing consists of big and rough Maine embossing and detailed subembossing. Area [ of the pars basilaris oiss occipitalis of the lobe of said Maine embossing ] S [x10-8cm2], and average spacing [ of said lobe ] (appearance pitch) P [μm], and average-of-roughness-height R. The interlayer for glass laminates to which area S[ of the base of the lobe of said subembossing ] [x10-8cm2], average spacing (appearance pitch) P[ of said lobe ] [μm], and average-of-roughness-height R' are characterized by satisfying following (1) thru/or the relation of (3).  
 $1/180 < S'/S < 1/2$  (1)  
 $1/11 < P'/P < 2/5$  (2)  
 $1/8 < R'/R < 1/2$  (3)

[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the interlayer for glass laminates. It is related with the interlayer which inserts between the glass plates of two sheets and constitutes a glass laminate in more detail, and is related with the good interlayer for glass laminates of synthesis degassing nature, such as workability especially at the time of doubling processing, seal nature with glass, and seal precedence prevention.

[0002]

[Description of the Prior Art] It is laminating glass which consists of a layered product by which the interlayer was inserted between two sheet glass, a glass laminate has the outstanding description of being hard to damage reinforcement greatly, and even when it damages, it is safe glass material in which a fragment does not disperse. For this reason, it is widely used as a windowpane of devices for transportation, such as an automobile end or aircraft, or a building. [0003] When manufacturing this glass laminate, after eliminating air which inserts the interlayer which consists of adhesive thermoplastics between the glass plates of two sheets, carries out preparative pressure arrival of the obtained layered product, and remains between each glass (degassing), actual sticking by pressure is carried out and a layered product is stuck completely. [0004] It is required that the interlayer used for the above-mentioned glass laminate should have the good degassing nature which can be set like preparative pressure groundbreaking at the time of storage in addition to the workability at the time of piling up that blocking of interlayers does not arise, glass, and an interlayer being good. The degassing nature especially at the time of preparative pressure arrival influences the quality of a glass laminate, the transparency of the glass laminate obtained when degassing was inadequate may worsen, or when an accelerated test is performed, air bubbles may produce it.

[0005] Although influenced by physical properties which are materials, such as a class of thermoplastics, and viscoelasticity, the comprehensive engine performance of the interlayer containing the above degassing nature will become the big factor as which the shape of surface type of an interlayer determines the comprehensive engine performance, if these physical properties are fixed and considered.

[0006] If the detailed irregularity of a large number especially called embossing is formed on the surface of an interlayer, it will be known that it is effective, and the interlayer by which embossing was formed in the front face is used conventionally. There are a thing in which the irregularity which has random magnitude and a random configuration as a gestalt of the embossing, for example was formed, a thing in which grid-like much \*\*\* were formed, etc.

[0007] Effectiveness is accepted about the workability improvement at the time of the conventional interlayer by which such embossing was formed in the front face piling up blocking prevention, glass plate, and interlayer of film. Moreover, a certain amount of effectiveness is accepted also about the degassing nature like preparative pressure groundbreaking. It is impossible however, to call it what degassing nature can not necessarily be satisfied with the conventional interlayer of in recent years by the linear velocity rise of the doubling process accompanying the expansion and the productivity drive of a glass pair difference by need

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excellent in synthesis degassing nature.

[0018] Namely, invention indicated to claim 1 of the claim of this invention In the interlayer for glass laminates by which much detailed projections (embossing) were prepared at least in one side of the film which consists of thermoplastics, or a sheet. Constitute the embossing from Maine embossing and subembossing, and Maine embossing has a comparatively uniform configuration and the relation which average spacing [ of area / of the pars basilaris ossis occipitalis of the lobe / S [x10-8cm<sup>2</sup>] and a lobe ] P [μm] becomes 1.5 <P/Sx100 <=5.5 is satisfied. And the average of roughness height of subembossing considers as the configuration which is below one half of Maine embossing.

[0017] Since the resistance to migration of the air at the time of a preliminary press becomes large here when the value of P/Sx100 is smaller than 1.5, in case it is degassing at the time of a roll preliminary press, the air remainder arises especially. Moreover, since a lobe stops being crushed by this condition easily, it becomes faulty [ a seal ], and faults, such as foaming and BEKU foaming, are produced after this sticking by pressure. On the other hand, when the value of P/Sx100 is larger than 5.5, before internal air is discharged in the periphery of glass, glass and an interlayer will stick (edge seal precedence), and, also even in after this sticking by pressure, air bubbles will remain. The range of this value of P/Sx100 is 2.5-4.5 suitably.

[0018] Moreover, invention indicated to claim 2 of the claim of this invention In the interlayer for glass laminates which becomes at least one side from the thermoplastics sheet or film which has much detailed irregularity (embossing). Said embossing is constituted from big and rough Maine embossing and detailed subembossing. Area [ of the pars basilaris ossis occipitalis of the lobe of said Maine embossing ] S [x10-8cm<sup>2</sup>], and average spacing [ of said lobe ] (appearance pitch) P [μm], and average-of-roughness-height R, Area S [ of the base of the lobe of said subembossing ] : [x10-8cm<sup>2</sup>], average spacing (appearance pitch) P [ of said lobe ] : [μm], and average-of-roughness-height R' consider as a configuration with which are satisfied of following

$$(1) \text{ thru/ or the relation of } (3),$$

$$1/180 < S/S' < 1/2 \quad (1)$$

$$1/11 < P/P' < 2/5 \quad (2)$$

$$1/6 < R/R' < 1/2 \quad (3)$$

[0019] When the value of 1/180 or less and P/P' is [ the value of 2/5 or more and R/R' ] 1/6 or less for the value of S/S', before internal air is discharged, glass and an interlayer stick around glass (edge seal precedence), and, also even in after these arrival and departure, air bubbles remain. Moreover, the autohesion force of interlayers and the slide wire of glass and an interlayer increase, and big trouble is caused to the workability at the time of glass laminate processing.

[0020] Since the resistance to migration of the air at the time of a preliminary press is strong when 1/2 or more and P/P' are [ 1/11 or less and R/R' ] 1/2 or more for the value of S/S', in case it is degassing at the time of a roll preliminary press, the air remainder happens especially. Moreover, since a lobe cannot be crushed easily, it becomes faulty [ a seal ], and after this sticking by pressure, foaming arises or faults, such as BEKU foaming, arise. Furthermore, the slide wire of glass and the film becomes small too much, a glass plate tends to shift in the preliminary press process of glass laminate processing, and workability is bad.

[0021] In addition, also in invention indicated to claim 2, the value of P/S is suitable at 7.0 or less [ 2.2 or more ].

[0022] The gestalt of Maine embossing and especially granularity are not limited in invention indicated to claim 1 or claim 2 mentioned above. For example, prisms, such as cones, such as a cone and a pyramid, a pseudo-cone, a prism, and a cylinder, etc. are useable as a configuration of a lobe. Moreover, generally the granularity of Maine embossing can be used in 10-70 micrometers. Furthermore, the array of a lobe may be random, or a regulation array may be used, and average spacing (pitch) and an average lobe bottom aspect product do not vary greatly, but if it has the shape of interlayer surface type are satisfied with of said each relational expression, the outstanding degassing nature can be demonstrated.

[0023] When not giving subembossing, the autohesion force and glass-film slide wire of film increase, and big trouble is caused to the workability at the time of glass laminate processing.

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increase of difficulty configuration glass laminates, such as a three-dimension curved surface with radius of curvature big, for example, etc. For the reason, air bubbles did not remain between the glass plate and the interlayer according to degassing nature being inadequate, or since an adhesive property (seal nature) was inadequate, a completely transparent glass laminate was not obtained, and it had the fault of foaming occurring after an accelerated test.

[0008] About the degassing nature improvement of such an interlayer for glass laminates, the advanced technology shown below in the former is proposed. For example, as shown in drawing 1, the glass laminate which carried out the laminating of the interlayer 5 which comes to form in the front face of a sheet 1 the projection 2 which a large number became independent of, and the glass plate 4 is indicated by JP1-32776B. In the interlayer 5 of this glass laminate, all the bases of each crevice 3 formed between the adjoining projections 2 are the same level, and they are formed so that the mutual crevice 3 may moreover continue. Invention given in this number official report is aiming at improvement in the workability at the time of piling up the blocking tightness, glass plate, and interlayer of interlayers by adopting such a configuration. In addition, let the gestalt of said projection 2 be a pyramid of medulla oblongata or a pseudo-pyramid of medulla oblongata.

[0009] Moreover, the interlayer which comes to form also in JP54-21209B (U.S. Pat. No. 578710 specification) the projection which a large number became independent of on the surface of the sheet is indicated. In this interlayer, irregularity is formed so that the depth of the crevice formed between projections may serve as predetermined range.

[0010]

[Problem(s) to be Solved by the Invention] However, the above conventional interlayers do not have in the addition enough degassing nature like preparative pressure groundbreaking. Especially, the depth of the crevice formed in the sheet front face in the interlayer given in said JP54-21209B has only gathered in general, and, now, cannot say that the degassing nature at the time of glass laminate manufacture is good. This is considered to be the result to which consideration is not paid at all about the configuration of the concave heights formed in the interlayer front face.

[0011] Moreover, the above conventional interlayers did not have the moderate ease of being crushed of embossing, and it had become the cause which produces foaming after this sticking-by-pressure process etc. That is, when the process which carries out preparative pressure arrival of a glass plate and the interlayer is in the inclination performed at a considerable high speed in recent years and it desecrates especially with a nip roll, the projection formed in the sheet front face must make air have to discharge smoothly. For this reason, it is required for adhesive (seal nature) reservation with glass that embossing should have the shape of surface type easily crushed in the pressure (about 5-10kg/cm<sup>2</sup>) and temperature (about 50-100 degrees C) at the time of a preliminary press.

[0012] However, if it is crushed before embossing tends [ too much ] to be crushed and reaches the above-mentioned preliminary press conditions, it will be in the periphery \*\*\*\*\* condition called seal precedence, and the Ayr \*\*\*\*\* condition arises, by Ayr covered as a result, a seal tear will be discovered and faults, such as foaming, will arise after this sticking-by-pressure process.

[0013] Moreover, when performing degassing by the vacuum preliminary press by the reduced pressure in a rubber bag, in order to avoid foaming by periphery seal precedence, while reducing degassing resistance, there is the need of balancing the ease of being crushed of embossing.

[0014] Then, this invention can balance the ease of being crushed of embossing in the ease of escaping of air, is excellent in degassing nature, and aims at offering the interlayer for glass laminates which can manufacture a glass laminate with good transparency.

[0015]

[Means for Solving the Problem] As a result of repeating research wholeheartedly for the above-mentioned fault dissolution, in the interlayer for glass laminates by which much detailed projections (embossing) were prepared at least in one side of the film which consists of thermoplastics, or a sheet, by improving the configuration of the embossing, we were able to attain the above-mentioned purpose and were able to realize the interlayer for glass laminates

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Moreover, effectiveness remarkable also in the edge seal precedence prevention at the time of a preliminary press is demonstrated by giving this subembossing. In addition, about subembossing, as long as the average of roughness height is below one half of the average of roughness height of Maine embossing, a configuration etc. is not limited, but even if there is dispersion, it demonstrates effectiveness enough, moreover — especially — a claim — two — corresponding — an interlayer — being related — S — : — P — : — R — : — each — a value — the average — having mentioned above — each — relational expression — satisfied — \*\*\*\*\* varying — — — — — even if — a problem — there is nothing.

[0024] It is not limited especially about heating contraction of an interlayer, either, but effectiveness will be accepted if it is the surface embossing configuration of satisfying the embossing conditions mentioned above. An interlayer contracts within a heating furnace at the time of a doubling processing preliminary press. Namely, produce a poor appearance or That what is necessary is just the range which the seal precedence by partial thick-film-izing of the interlayer inside the glass laminate accompanying deformation of the glass by large contraction of an interlayer or contraction of the transformation and/or the interlayer to a glass laminate does not discover. For example, if it is 50 degrees C and the interlayer which has 5% or less of heating contraction by 1Hr, it can use.

[0025] Although the interlayer for glass laminates in this invention is used for the layered product of combination, such as [glass / interlayer / glass], [glass / interlayer / glass / interlayer / thermoplastics layer], [glass / interlayer / thermoplastics layer], and [a thermoplastics layer / interlayer / glass / interlayer / thermoplastics layer], it is not limited to especially these.

[0026] As the above-mentioned thermoplastics, a polyvinyl-butylal, polyurethane, polyvinyl chloride-ethylene copolymer, vinyl chloride-ethylene-glycidyl methacrylate copolymer, vinyl chloride-ethylene-glycidyl acrylate copolymer, vinyl chloride-glycidyl methacrylate copolymer, vinyl chloride-glycidyl acrylate copolymer, polyvinylidene chloride, and polyvinylidene chloride-acrylonitrile copolymer, polyvinyl acetate, an ethylene-vinylacetate copolymer, polyvinyl-acetal-polyvinyl-butylal mixture, etc. can be mentioned, for example.

[0027] Especially in these, a polyvinyl-butylal, polyurethane, and vinyl chloride-ethylene-glycidyl methacrylate copolymer is used preferably.

[0028] Next, especially as a plasticizer which kneads to such a vinyl system resin constituent, although not limited, dioctyl phthalate, dibutyl phthalate, and adipic-acid-G 2-ethylhexyl, adipic-acid JISO dodecyl, epoxy fatty acid monoester, triethylene glycol di-2-ethyl butyrate, triethylene glycol-G 2-ethylhexate, a dibutyl sebacate, dibutyl sebacate, etc. can be mentioned, for example. The loadings of a plasticizer have 20 ~ 45% of the weight of the desirable range to vinyl system resin.

[0029] As long as the embossing conditions mentioned above are satisfied, the well-known approach of arbitration can be used for the approach of fabricating from the above-mentioned thermoplastics constituent to the interlayer for glass laminates. For example, it can fabricate by the calendaring roll method, the extrusion method, the casting method, a tubular film process, etc. The embossing configuration grant to the interlayer front face is not especially limited, although what is necessary is just to use approaches, such as embossing grant dice, such as an embossing roll and a die roll, and in respect of a lip. Moreover, on the occasion of sheet forming, a thermostabilizer, an antioxidant, etc. may be blended with a sheet if needed. Furthermore, in order to give penetration-proof [ quantity ], an adhesive strength regulator, for example, a metal salt etc., may be blended.

[0030]

[Function] By giving embossing which is satisfied with at least one side of an interlayer of the embossing conditions mentioned above, in the case of preparative pressure arrival, the air which intervenes between a glass plate and an interlayer can be discharged smoothly, and it can fully desecrate, seal precedence does not take place, but the adhesive property (seal nature) which was excellent in the glass-interlayer is acquired. Consequently, it does not become insufficient [ degassing ] even if it raises the linear velocity of a doubling processing process sharply. Moreover, the degassing nature which was excellent at the time of manufacture of the large

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difficulty configuration glass laminate of a glass pair difference is demonstrated, and after this sticking by pressure becomes it is completely transparent and possible [ manufacturing efficiently the glass laminate which faults, such as \*\*KU foaming, do not produce ].

[0031]

[Example] Next, the example of this invention is explained. The pitch of embossing, the configuration of a lobe, a lobe bottom aspect product, and granularity were set as various conditions, the interlayer was produced, and blocking nature was investigated. In addition, the pitch (mean distance between lobe crest (top-most vertices) (= [observation area / lobe number] 1/2) P of observation of a surface embossing configuration and Maine embossing and the lobe bottom aspect product of Maine embossing were surveyed by stereoscopic-microscope observation.

[0032] Moreover, granularity was measured with a non-contact laser type measurement machine (pel ten company make) and surface type-like analysis equipment (\*\*\*\*\* machine). Furthermore, the interlayer was judged in 100mmx25mm magnitude, two of them were accumulated, the 2kg load was carried on it, and after leaving blocking nature for 24 hours, it was pulled, it measured 180-degrees Peel-axfoliation force (N=5) by trial, and evaluated. It is shown that adhesive strength is so large that a value is large, and workability is bad.

[0033] First, the example 1 and example 2 corresponding to invention indicated by claim 1 of a claim are explained as compared with the example 1 of a comparison - the example 3 of a comparison.

[0034] The embossing roll was used for both the front faces of the sheet made from a [example 1] plasticization polyvinyl butyral, embossing was formed in them, and the interlayer was produced. The surface embossing configuration where the embossing conditions (conditions of a claim according to claim 1) of this invention mentioned above are satisfied, Maine embossing which changes, and random subembossing are given. An embossing configuration etc. is shown in Table 1.

[0035] It had the surface embossing configuration where the embossing conditions (conditions of a claim according to claim 1) of this invention which carried out the [example 2] above-mentioned were satisfied, and as shown table 1, except that the numeric values differed, the interlayer was produced on the same conditions as an example 1 in the example 1.

[0036] The [example 1 of comparison] embossing was perfect random embossing, and as shown in Table 1, except that the configuration of embossing differed from a numeric value, the interlayer was produced on the same conditions as an example 1.

[0037] As shown in the [example 2 of comparison] table 1, the configuration of embossing differed from the numeric value, and the interlayer was produced on the same conditions as an example 1 except not giving subembossing.

[0038] As shown in the [example 3 of comparison] table 1, the interlayer was produced on the same conditions as an example 2 except not giving subembossing.

[0039] Next, the glass laminate was produced by the approach of of the following (a) and (b) using the interlayer obtained in each above-mentioned example and the example of a comparison, respectively.

[0040] (a) Insert the preparative pressure arrival and this sticking-by-pressure interlayer by the rolling method between two sheet glass, and cut off the overflowing part. This layered product was heated in heat oven in each temperature of 50 degrees C, 60 degrees C, 70 degrees C, 80 degrees C, 90 degrees C, and 100 degrees C, and preparative pressure arrival was performed to the nip roll by through and the rolling method by linear velocity 10 m/min. The layered product after this preparative pressure arrival was held for 10 minutes on conditions with a pressure [ of 14kg/cm<sup>2</sup> ], and a temperature of 140 degrees C within the autoclave, temperature was lowered and decompressed to 50 degrees C after that, and this adhesion was ended.

[0041] (b) Insert the preparative pressure arrival and this sticking-by-pressure interlayer by the manometric method between two sheet glass, and cut off the overflowing part. This layered product was put into the rubber bag, the inside of a rubber bag was connected to the reduced pressure system, and it held under reduced pressure of -600mmHg during 10 minutes by whenever [ open air stoving temperature / of 60 degrees C, 80 degrees C, 100 degrees C, and

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120 degrees C ], it returned to the outside atmospheric pressure, and preparative pressure arrival was ended. This sticking by pressure was performed by the same approach as the above (a).

[0042]

[Table 1]

		実施例 1	実施例 2	比較例 1	比較例 2	比較例 3
メイン エン ボス 形状	ピッチ：P [μm]	420	380	220	420	380
	突出部形状	楕円形	八角形	約り楕円形	楕円形	八角形
	突出部底面面積：S [×10 <sup>-4</sup> cm <sup>2</sup> ]	11310	8556	37325	53093	8556
	突出部底部径 [μm]	直径120	対角110	直径218	直径260	対角110
	粗さ [μm]	37	35	32	38	35
	P/S×100	3.7	4.4	0.6	0.8	4.4
サブ エン ボス	平均ピッチ [μm]	100	80	80	無し	無し
	平均粗さ [μm]	14	12	12		
	突出部底部径 [μm]	15～90	20～80	20～80		
ブローキング性 [g/cm]		85	80	190	240	170

[0043] The obtained glass laminate was heated and the existence of generating of air bubbles was investigated. That is, after heating the glass laminate of ten sheets using the interlayer of the same kind for 2 hours and annealing it to a room temperature at 135 degrees C in oven, respectively, the measurement size which air bubbles produced in the glass laminate was investigated. The result was shown in Table 2 about the glass laminate produced by the rolling method, and was shown in Table 3 about the glass laminate produced with the manometric method again, respectively.

[0044]

[Table 2]

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予備圧着温度 [°C]	実施例1	実施例2	比較例1	比較例2	比較例3
50	○	○	××	×	○
60	○	○	×	△	○
70	○	○	○	○	△
80	○	○	○	○	×
90	○	○	△	△	××
100	○	○	××	×	××
備考	広い温度範囲で良好	広い温度範囲で良好	不足	シールやや不足	シール先行し多い

[0045]

[Table 3]

予備圧着温度 [°C]	実施例1	実施例2	比較例1	比較例2	比較例3
60	○	○	××	×	○
80	○	○	○	○	△
100	○	○	△	△	×
120	○	○	×	×	××
備考	広い温度範囲で良好	広い温度範囲で良好	不足	シールやや不足	シール先行し多い

[0046] Next, the example 3 and example 4 corresponding to invention indicated by claim 2 of a claim are explained as compared with the example 4 of a comparison, and the example 5 of a comparison.

[0047] The embossing roll was used for both the front faces of the sheet made from a [example 3] plasticization polyvinyl butyral, embossing was formed in them, and the interlayer was produced. The surface embossing configuration where the embossing conditions (conditions of a claim according to claim 2) of this invention mentioned above are satisfied, Maine embossing

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which changes, and random subembossing are given. An embossing configuration etc. is shown in Table 4.

[0048] It had the surface embossing configuration where the embossing conditions (conditions of a claim according to claim 2) of this invention which carried out the [example 4] above-mentioned were satisfied, and as shown table 4, except that the numeric values differed, the interlayer was produced on the same conditions as an example 3 in the example 3.

[0049] As shown in the [example 4 of comparison] table 4, except that the numeric values of subembossing differed, the interlayer was produced on the same conditions as an example 3.

[0050] As shown in the [example 5 of comparison] table 4, except that the numeric values of subembossing differed, the interlayer was produced on the same conditions as an example 4.

[0051] Next, the glass laminate was produced by the approach of of the following (c) and (d) using the interlayer obtained in each above-mentioned example and the example of a comparison, respectively.

[0052] (c) Insert the preparative pressure arrival and this sticking-by-pressure interlayer by the rolling method between two sheet glass, and cut off the overflowing part. This layered product was heated in heat oven in each temperature of 50 degrees C, 90 degrees C, and 100 degrees C, and preparative pressure arrival was performed to the nip roll by through and the rolling method by linear velocity 15 m/min and linear pressure 2.5 kg/cm. The layered product after this preparative pressure arrival was held for 10 minutes on conditions with a pressure [ of 14kg/cm<sup>2</sup> ], and a temperature of 140 degrees C within the autoclave, temperature was lowered and decompressed to 50 degrees C after that, and this adhesion was ended.

[0053] (d) Insert the preparative pressure arrival and this sticking-by-pressure interlayer by the manometric method between two sheet glass, and cut off the overflowing part. This layered product was put into the rubber bag, the inside of a rubber bag was connected to the reduced pressure system, and it held under reduced pressure of -600mmHg during 10 minutes by whenever [ open air stoving temperature / of 60 degrees C, 100 degrees C, and 120 degrees C ], it returned to the outside atmospheric pressure, and preparative pressure arrival was ended. This sticking by pressure was performed by the same approach as the above (c).

[0054]

[Table 4]

[http://www4.ipdl.ncipi.go.jp/cgi-bin/tran\\_web.cgi.ejje](http://www4.ipdl.ncipi.go.jp/cgi-bin/tran_web.cgi.ejje)

2008/04/27

		実施例 3	実施例 4	比較例 4	比較例 5
メイン エン ボス 形 ス 形 状	突出部底面面積: S [ $\times 10^{-4} \text{cm}^2$ ]	11310	8558	実 施 例 3 と 同 じ	実 施 例 4 と 同 じ
	突出部底面径 [μm]	直径120	対角110		
	ピッチ: P [μm]	420	380		
	平均粗さ: R [μm]	31	30		
	突出部形状	楕円隆	8角隆		
	P/S $\times 100$	3.7	4.4		
サブ エン ボス	突出部底面面積: S' [ $\times 10^{-4} \text{cm}^2$ ]	707	2827	8	6362
	平均ピッチ: P' [μm]	100	80	30	90
	平均粗さ: R' [μm]	11	12	4	17
	S' / S	0.063	0.330	0.0007	0.744
	P' / P	0.238	0.211	0.071	0.236
	R' / R	0.297	0.333	0.108	0.567
	ブロッキング性 [g/cm]	85	80	220	78

[0055] The obtained glass laminate was heated and the existence of generating of air bubbles was investigated. That is, after heating the glass laminate of ten sheets using the interlayer of the same kind for 2 hours and annealing it to a room temperature at 135 degrees C in oven, respectively, the measurement size which air bubbles produced in the glass laminate was investigated.

[0056] The result was shown in Table 5 about the glass laminate produced by the rolling method, and was shown in Table 6 about the glass laminate produced with the manometric method again, respectively.

[0057]

[Table 5]

予備圧着温度 [°C]	実施例 3	実施例 4	比較例 4	比較例 5
50	O	O	O	xx
90	O	O	Δ	O
100	O	O	xx	Δ
備 考	広い温度範囲で良好	広い温度範囲で良好	シール先行	シール不良

[0058]

[Table 6]

予備圧着温度 [°C]	実施例 3	実施例 4	比較例 4	比較例 5
60	O	O	O	x
100	O	O	Δ	Δ
120	O	O	x	Δ
備 考	広い温度範囲で良好	広い温度範囲で良好	シール先行	シール不良

[0059]

[Effect of the Invention] By the above explanation, also when it doubles the case where the large difficulty configuration glass laminate of a glass pair difference is manufactured according to the interlayer for glass laminates of this invention so that clearly, and for a productivity drive and the linear velocity in a process is raised, the ease of being crushed of embossing can be balanced in the ease of escaping of air, it excels in degassing nature and a glass laminate with good transparency can be offered. Moreover, it sets like preparative pressure groundbreaking, and it is a large temperature requirement, and degassing in a short time becomes possible, and workability

## \* NOTICES \*

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damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing an example of the glass laminate using the conventional interlayer for glass laminates.

[Description of Notations]

- 1 Sheet
- 2 Projection
- 3 Crevice
- 4 Glass Plate
- 5 Interlayer

[Translation done.]